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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/754,371	KOBAYASHI ET AL.	
	Examiner	Art Unit	
	Dennis Myint	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/09/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 30, 2007, has been entered.

2. The amendment filed on October 30, 2007 has been received and entered. Claims 1-30 are pending in this application. Claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20 were amended. Claims 1, 4, 6, 8, 10, 11, 14, 16, 18, and 20 are independent claims.

Response to Arguments

3. Applicant's arguments filed on October 30, 2007 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-3, 10-13, 20, 21, 25, 26, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (hereinafter "Chen", U.S. Patent Application Publication Number 2004/0233910) in view of Lubbers et al., (hereinafter "Lubbers", U.S. Patent Application Publication Number, 2003/0084241) and further in view of Kurio (U.S. Patent Number 5774640) and

further in view of Chhatrapati et al., (hereinafter "Chhatrapati", U. S. Patent Application Publication Number 2004/0243547).

As per claim 1, Chen et al. is directed to a storage device controlling apparatus (Figure 3) "including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed" (Chen et al., Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to said requests to input and output data to a storage device" (Chen et al. Paragraph 0039, i.e., *The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols*), and teaches the limitations:

"a file lock table to be used by the file access processing section of the first controller to perform exclusive control, at a file level, on file accesses received by the file access processing section" (Chen, Paragraph 0039, i.e., *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file system*);

"a logical-volume lock table to be used by the I/O processor of the first channel controller to perform exclusive control of a file, at a block level, on file accesses received by the file access processing section" (Chen, Paragraph

0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*) (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit Numbers in paragraph 0052 as "*allocated storage resources from storage server 240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)*);

"a data area of the file is locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit Numbers in paragraph 0052 as "*allocated storage resources from storage server*

240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)); and

"the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* and). (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit Numbers in paragraph 0052 as "*allocated storage resources from storage server 240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)*).

Chen does not explicitly teach the limitations: "a plurality of first channel controllers each of the first channel controllers being connected to a LAN", and "wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume", "(2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume", and (3) "wherein the first channel controllers are

grouped into clusters comprising a plurality of first channel controllers, wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, the first channel controller takes over processing for the second first channel controller" .

Lubbers teaches the limitations:

"a plurality of first channel controllers each of the first channel controllers being connected to a LAN" (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303.*),

"wherein when the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*),

(1) "if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection*

protocol used by the hosts to the uniquely identified LUN 102; and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) and

(2) "if more than one of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns*).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the apparatus of Chen for NAS with the apparatus of Lubbers for NAS, which comprise a plurality of channel controllers, so that the combined apparatus method would comprise a plurality of channel controllers and would perform file-locks, access control, and logical/physical mappings, wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed, and (2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume, control is

performed wherein an I/O process is performed for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the logical volume lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output form being performed. One would have been motivated to do in order to provide large capacity, high availability and high reliability storage (Lubbers, Paragraph 0007, i.e., *Large capacity, high availability, and high reliability storage architectures typically involve complex typologies of physical storage devices and controllers).*

Chen in view of Lubber does not explicitly teach the limitation: "wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers, wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, the first channel controller takes over processing for the second first channel controller".

On the other hand, Kurio teaches the limitations:

"wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers" (Kurio, Column 6 Lines 14-16, i.e., *This implementation of computer 101 supports up to four Ethernet controllers;* Also see Kurio, Figure 2 , i.e., TWO ETHERNET CONTROLLER LAN CONTROLLER MODULES), (wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the

status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that) "a second first channel controller in the cluster is not operating normally, the first channel controller takes over processing for the second first channel controller" (Kurio, Column 8 Line 14-34). Kurio teaches a method and system for a fault tolerant network interface controller, wherein up to four Ethernet controllers (more than one alternate controller) are used (Kurio, Column 8 Line 14-15). Kurio additionally discloses that, when the primary Ethernet controller fails, the process failovers to the alternate Ethernet controller (Kurio, Column 8 Line 14-34). Second failover means, when said different interface controller fails, transfers processing of said different interface controller to normal interface controller include among said first interface controllers. It is well known in the art that takeover mechanism or any other mechanism could be stored in any type of memory, including shared logical volumes.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine device of Chen in view of Lubbers with the feature of responding to failovers as taught by Kurio, so that the combined device would constitute a storage device controlling apparatus including a plurality of first channel controllers each of the first channel controllers being connected to a LAN and having a circuit board, wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers and wherein if the second first channel controller in the cluster is not operating normally, the first channel controller takes over processing for the

second first channel controller. One would have been motivated to do so in order to *provide a fault-tolerant network interface* (Kurio, Column 2 Lines 32-36).

Chen in view of Lubbers and further in view of Kurio does not explicitly teach the limitation: "(wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers) wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally" (the first channel controller takes over processing for the second first channel controller)" (Kurio, Column 8 Line 14-34). Limitations in parentheses are taught by Kurio as discussed above.

On the other hand, Chhatrapati teaches the limitation:

"wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally" (Chhatrapati Figure 1: *Conrollers;* Paragraph 0057, i.e., *To safeguard against any single point of failure, the mechanism allows running of a backup controller which* ***monitors*** *the primary controller and takes charge when the primary is not able to do its job;* Paragraph 0094, *To safeguard against any single point of failure, the mechanism allows the*

system to run a backup controller which keeps an eye on the primary controller and takes charge when the primary is not able to do its job).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the storage device controlling apparatus of Chen in view of Lubbers and further in view of Kurio to add the feature of having a first controller card monitor a second controller card and, if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, making the first controller card take over processing for the second controller card, as taught by, Chhatrapati, so that, in the resultant storage device controlling apparatus, the first channel controllers are grouped into clusters comprising a plurality of first channel controllers (Kurio) wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally the first channel controller takes over processing for the second first channel controller (Chhatrapati). One would have been motivated to do so in order to *safeguard against any single point of failure* (Chhatrapati, Paragraph 0057).

As per claim 2, Chen in view of Lubbers further in view of Kurio and further in view of Chhatrapati teaches the limitation:

"wherein said requests to input and output data are sent in accordance with at least two types of network file system protocols, and if, during said exclusive control which is performed upon accepting one of said requests to input and output data sent in accordance with one of network file system protocols, another said request to input/output data sent in accordance with another network file system protocol is accepted, an effect of said exclusive control is also reflected on the another request to input/output data" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)" and "File Level Access Control Protocol (FLAP) and These protocols permit shared access to files and folders on a file system*).

As per claim 3, Chen in view of Lubbers further in view of Kurio and further in view of Chhatrapati teaches the limitation:

"wherein a memory area of said storage device is managed in said first logical volume serving as a unit, the logical volume being logically set on the memory area" (Chen, Figure 8: *Virtual Device, Virtual Disk 1*), and "said I/O processor performs exclusive control of said first logical volume in response to said exclusive control of the file" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)* and *File Level Access Control Protocol (FLAP))*;.

Claim 10 is rejected on the same basis as claim 1.

Claim 11 is essentially the same as claim 1 except that it set forth the claimed invention as a method of controlling a storage device controlling apparatus including a plurality of controllers rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 12 is essentially the same as claim 2 except that it set forth the claimed invention as a method of controlling a storage device controlling apparatus including a plurality of controllers rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 13 is essentially the same as claim 3 except that it set forth the claimed invention as a method of controlling a storage device controlling apparatus including a plurality of controllers rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 20 is essentially the same as claim 1 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

As per claim 21, Chen in view Lubbers and further in view of Kurio and further in view of Chhatrapati teaches the limitations:

"further comprising a second channel controller connected to a SAN and having an I/O process which processes to input/output that have been received via the SAN" (Chen, Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*) (Note that in the apparatus of Chen in view of Lubbers, Gigabit Ethernet Switch/Router of Chen would be functioning like the second channel controller and network storage controllers (NSCs)of Lubbers would be functioning like the plurality of first channel controllers);

"wherein when the plurality of first channel controllers and the second controller shares a second logical volume" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system.* Note that in the combined apparatus of Chen and Lubbers, a plurality of first channel controllers would share the logical volume(s) of Lubbers and the plurality of first channel controllers and the second controller would share the logical volumes of Chen.), (1) "if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms*

of a logical block address;), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access) ; and (2) "if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed

in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

Claim 25 is rejected on the same basis as claim 21.

Claim 26 is rejected on the same basis as claim 21.

Claim 30 is rejected on the same basis as claim 21.

7. Claims 4-9, 14-19, 22-24, and 27- 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Lubbers and further in view of Kurio and further in view of Chhatrapati and further in view of Nelson et al., (hereinafter "Nelson", U.S. Patent Number 5928367).

As per claim 4, Chen et al. is directed to a storage device controlling apparatus (Figure 3) "including a channel controller having a circuit board on which a file access processing section and an I/O processor are formed" (Chen et al., Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from at least one information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to said requests to input and output data to a storage device" (Chen et al.

Paragraph 0039, i.e., *The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols*), and teaches the limitations:

"a file lock table to be used by the file access processing section of the first controller to perform exclusive control, at a file level, on file accesses received by the file access processing section" (Chen, Paragraph 0039, i.e., *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file system*);

"a logical-volume lock table to be used by the I/O processor of the first channel controller to perform exclusive control of a file, at a block level, on file accesses received by the file access processing section" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*) (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit Numbers in paragraph 0052 as "*allocated storage resources from storage server 240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)*);

"a data area of the file is locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output

form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit Numbers in paragraph 0052 as "*allocated storage resources from storage server 240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)*); and

"the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* and). (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit

Numbers in paragraph 0052 as "*allocated storage resources from storage server 240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)*).

Chen does not explicitly teach the limitations: "a plurality of first channel controllers each of the first channel controllers being connected to a LAN", and "wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume", "(2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume", and (3) "wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers, wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, the first channel controller performs the following fail-over processing: The first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command, the first first channel controller acquires processing information about the second first channel from a shared logical volume, and the first first channel controller uses the acquired information to take over processing for the second channel controller".

Lubbers teaches the limitations:

"a plurality of first channel controllers each of the first channel controllers being connected to a LAN" (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303.*),

"wherein when the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*),

(1) "if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) and

(2) "if more than one of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk*

media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the apparatus of Chen for NAS with the apparatus of Lubbers for NAS, which comprise a plurality of channel controllers, so that the combined apparatus method would comprise a plurality of channel controllers and would perform file-locks, access control, and logical/physical mappings, wherein when the plurality of first channel controllers shares a first logical volume", (1) if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed, and (2) if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume, control is performed wherein an I/O process is performed for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the logical volume lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output form being performed. One would have been motivated to do in order to provide large capacity, high availability and high reliability storage (Lubbers, Paragraph 0007, i.e., *Large capacity, high*

availability, and high reliability storage architectures typically involve complex typologies of physical storage devices and controllers).

Chen in view of Lubber does not explicitly teach the limitation: ""wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers, wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, the first channel controller performs the following fail-over processing: The first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command, the first first channel controller acquires processing information about the second first channel from a shared logical volume, and the first first channel controller uses the acquired information to take over processing for the second channel controller".

On the other hand, Kurio teaches the limitations:

"wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers" (Kurio, Column 6 Lines 14-16, i.e., *This implementation of computer 101 supports up to four Ethernet controllers;* Also see Kurio, Figure 2 , i.e., TWO ETHERNET CONTROLLER LAN CONTROLLER MODULES), (wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the

status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that) "a second first channel controller in the cluster is not operating normally, the first channel controller performs the.following fail-over processing:" (Kurio, Column 8 Line 14-34) "(the first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command), the first first channel controller acquires processing information about the second first channel from a shared logical volume, and the first first channel controller uses the acquired information to take over processing for the second channel controller" (Kurio, Column 8 Lines 14-32, i.e., *Periodically, logical device driver 450 invokes a polling protocol for the purpose of exercising the transmission and reception capabilities of both primary and alternate Ethernet controllers 311 and 312, thereby detecting any latent faults in the primary and alternate Ethernet controllers 311 and 312, and exercising the primary Ethernet controller when the network traffic is minimal. Should the polling process reveal a fault of sufficient severity (see below) in primary Ethernet controller 311, primary Ethernet controller 311 is disabled and* ***taken out of service by the "logical" device driver*** *450. In this embodiment, a "disable" command* ***is written into the "short I/O space"*** *of primary Ethernet controller 311. At this point,* ***logical device driver*** *450 causes the alternate Ethernet controller 312 to assume the MAC address of the primary Ethernet controller 311 then in effect, by writing a command into the "short I/O space" of alternate Ethernet controller 312*). Note that logical device

drivers employs logical space/volume and in the case of Kurio's failover mechanism, both controllers the logical space/volume maintained by the logical device driver. In fact, Kurio teaches a method and system for a fault tolerant network interface controller, wherein up to four Ethernet controllers (more than one alternate controller) are used (Kurio, Column 8 Line 14-15). Kurio additionally discloses that, when the primary Ethernet controller fails, the process failover to the alternate Ethernet controller (Kurio, Column 8 Line 14-34); Second failover means, when said different interface controller fails, transfers processing of said different interface controller to normal interface controller include among said first interface controllers. It is well known in art that takeover mechanism or any other mechanism could be stored in any type of memory, including shared logical volumes.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to combine device of Chen in view of Lubbers with the feature of responding to failovers as taught by Kurio, so that the combined device would constitute a storage device controlling apparatus including a plurality of first channel controllers each of the first channel controllers being connected to a LAN and having a circuit board, wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers and wherein if the second first channel controller in the cluster is not operating normally, the first channel controller takes over processing for the second first channel controller. One would have been motivated to do so in order to *provide a fault-tolerant network interface* (Kurio, Column 2 Lines 32-36).

Chen in view of Lubbers and further in view of Kurio does not explicitly teach the limitation: "(wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers) wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally", (the first channel controller performs the following fail-over processing: (Kurio, Column 8 Line 14-34 ;Limitations in parentheses are taught by Kurio as discussed above) "The first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command; (the first first channel controller acquires processing information about the second first channel from a shared logical volume", and the first first channel controller uses the acquired information to take over processing for the second channel controller). Limitations in the parentheses are taught by Chen in view of Lubbers and further in view of Kurio, as discussed above.

On the other hand, Chhatrapati teaches the limitation:

"wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel

controller in the cluster is not operating normally" (Chhatrapati Figure 1: *Conrollers;* Paragraph 0057, i.e., *To safeguard against any single point of failure, the mechanism allows running of a backup controller which* ***monitors*** *the primary controller and takes charge when the primary is not able to do its job;* Paragraph 0094, *To safeguard against any single point of failure, the mechanism allows the system to run a backup controller which keeps an eye on the primary controller and takes charge when the primary is not able to do its job*).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the storage device controlling apparatus of Chen in view of Lubbers and further in view of Kurio to add the feature of having a first controller card monitor a second controller card and, if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, making the first controller card take over processing for the second controller card, as taught by, Chhatrapati, so that, in the resultant storage device controlling apparatus, the first channel controllers are grouped into clusters comprising a plurality of first channel controllers (Kurio) wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller, and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally the first channel controller takes over processing for the second first channel controller (Chhatrapati). One would

have been motivated to do so in order to *safeguard against any single point of failure* (Chhatrapati, Paragraph 0057).

Chen in view of Lubbers and further in view of Kurio and further in view of Chhatrapati does not explicitly teach the limitation: "The first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command".

On the other hand, Nelson teaches the limitation:

"the first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command" (Nelson, Column 9 Line 66 through Column 10 Line 2, i.e., *Message number 6, PLEASE -RESET, is a message sent by either controller to the other when the other needs to be reset to correct some failure that has occurred. The only valid reply is OK -RESETTING*).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the storage device controlling apparatus of Chen in view of Lubbers and further in view of Kurio and further in view of Chhatrapati to add the feature of having the first channel controller issue a reset command to the second first channel controller and having the second first channel controller send a response to the first first channel controller acknowledging receipt of the reset command, as taught by Nelson, so that, in the resultant storage device controlling apparatus, the first channel controller wuld

issue a reset command to the second first channel controller and if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command, the first first channel controller would acquire processing information about the second first channel from a shared logical volume and the first first channel controller would use the acquired information to take over processing for the second channel controller. One would have been motivated to do so in order to *provide immediate, accurate, and reliable failover in the event of failure of one controller or its memory* (Nelson, Column 1 Lines 44-48).

As per claim 5, Chen in view of Lubbers and further in view of Kurio and further in view of Chhatrapati and further in view of Nelson teaches the limitation:

"wherein the first channel controllers include at least one enabled to communicate with the information processing apparatus through a Fiber Channel" (Lubbers, Paragraph 0051, i.e., *fiber channel drive;* and Chen, Figure 1B, *Prior Art*). Also, official note is taken that the use of fiber channel for communication networks is notoriously well known in the art.

Claim 6 is rejected on the same basis as claim 4.

Claim 7 is rejected on the same basis as claim 5. Claim 5 incorporates all the limitations of claim 4.

As per claim 8, Chen in view of Lubbers and further in view of Kurio and further in view of Chhatrapati and further in view of Nelson is directed to a storage device controlling apparatus including a plurality of first channel controllers, each of the first channel controllers being connected to a LAN (Lubbers, Figure 2 and Figure 3; Paragraph 0047, i.e., *Storage cells 203 are accessible through LANs/WANs 207. Storage cells 203 essentially implements a storage pool;* Paragraph 0049, i.e., *As shown in Fig. 3, each storage cell 203 in the preferred embodiment comprises a pair of network storage controllers (NSCs) 301 coupled by a fiber channel arbitrated loop (FCAL) to a plurality of hard disks located in disk cabinet 303*) and a circuit board on which a file access processing section and an I/O processor are formed (Chen, Figure 3: *Gigabit Ethernet Switch/Router 270* and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e. *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*), "the file access processing section receiving requests to input and output data in files as units sent from an information processing apparatus via a network, the I/O processor outputting I/O requests corresponding to said requests to input and output data to a storage device" (Chen, Paragraph 0039, i.e., *The figures show storage server 240 connected to storage devices 290 and 170, for example, via storage interfaces 260. Storage server 240 supports two types of data storage protocols*), and teaches the limitations:

"a section setting at least one of logical volumes logically set on a memory area of said storage device as a shared first logical volume accessible from each

of said first channel controllers" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*);

"a file lock table to be used by the file access processing section of the first channel controllers to perform exclusive control, at a file level, on file requests received by the file access performing section" (Chen, Paragraph 0039, i.e., *File Level Access Control Protocol (FLAP)* and *These protocols permit shared access to files and folders on a file system*): and

"a logical-volume lock table to be used by the I/O processor of the first channel controllers to perform exclusive control, at a block level, on file requests received by the file access processing section" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*) (Note that it can be inferred that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access). Additionally, it is well known in the art, in Network-Attached Storage (NAS) systems, logical volume lock tables are used to control access to logical volumes. Also note that Chen teaches Logical Unit Numbers in paragraph 0052 as "*allocated storage resources from storage server 240 are identified by server name/device ID, which is mapped to the local SCSI ID and logical unit number (LUN)*);

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) "and the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*), "a data area of the file is locked with the use of the file lock table to prohibit an I/O process for the others of the plurality of requests to input/output form being performed while the first channel controller performs an I/O process for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* ; and Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"). Note that it is inherent the disclosure of Chen that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access)

"wherein if only one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*) "and the plurality of first channel controllers shares a first logical volume" (Lubbers, Paragraph 0034, i.e., *Environment 100 shows a storage pool 101 comprising an arbitrarily large quantity of storage space from which logical disks (also called logical units or LUNs) 102 are allocated*), "the data area of the file is locked with the use of the logical volume lock table to prohibit an I/O process for the others of the plurality of requests to input/output from being performed while an I/O process is performed for one of the plurality of requests to input/output" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system* and Yamamoto, Column 7 Line 36-60, i.e. "*The system administrator may create data structures, for example, in the form of the table 120 illustrated in FIG. 5.*" and Column 8 Line 35-64, i.e. "*.. .. the logical volume information could include information respecting whether or not the particular logical volume is accessible to certain types of access.*"). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access);

"wherein the first channel controllers are grouped into clusters comprising a plurality of first channel controllers" (Kurio, Column 6 Lines 14-16, i.e., *This implementation of computer 101 supports up to four Ethernet controllers;* Also see Kurio, Figure 2 , i.e., TWO ETHERNET CONTROLLER LAN CONTROLLER MODULES), "wherein each of the first channel controllers in a cluster monitors a status indicator of each of the other first channel controllers in the cluster, the status indicator including an operating state of an associated of first channel controller" (Chhatrapati Figure 1: *Conrollers;* Paragraph 0057, i.e., *To safeguard against any single point of failure, the mechanism allows running of a backup controller which* ***monitors*** *the primary controller and takes charge when the primary is not able to do its job;* Paragraph 0094, *To safeguard against any single point of failure, the mechanism allows the system to run a backup controller which keeps an eye on the primary controller and takes charge when the primary is not able to do its job*), and wherein if a first first channel controller detects that a second first channel controller in the cluster is not operating normally, the first channel controller performs the following fail-over processing:" (Kurio, Column 8 Line 14-34) "the first channel controller issues a reset command to the second first channel controller; if the second first channel controller sends a response to the first first channel controller acknowledging receipt of the reset command" (Nelson, Column 9 Line 66 through Column 10 Line 2, i.e., *Message number 6, PLEASE -RESET, is a message sent by either controller to the other when the other needs to be reset to correct some failure that has occurred. The only valid reply is OK -RESETTING*), "the first first

channel controller acquires processing information about the second first channel from a shared logical volume, and the first first channel controller uses the acquired information to take over processing for the second channel controller" (Kurio, Column 8 Lines 14-32, i.e., *Periodically, logical device driver 450 invokes a polling protocol for the purpose of exercising the transmission and reception capabilities of both primary and alternate Ethernet controllers 311 and 312, thereby detecting any latent faults in the primary and alternate Ethernet controllers 311 and 312, and exercising the primary Ethernet controller when the network traffic is minimal. Should the polling process reveal a fault of sufficient severity (see below) in primary Ethernet controller 311, primary Ethernet controller 311 is disabled and* ***taken out of service by the "logical" device driver*** *450. In this embodiment, a "disable" command* ***is written into the "short I/O space"*** *of primary Ethernet controller 311. At this point,* ***logical device driver*** *450 causes the alternate Ethernet controller 312 to assume the MAC address of the primary Ethernet controller 311 then in effect, by writing a command into the "short I/O space" of alternate Ethernet controller 312*). Note that logical device drivers employs logical space/volume and in the case of Kurio's failover mechanism, both controllers the logical space/volume maintained by the logical device driver. In fact, Kurio teaches a method and system for a fault tolerant network interface controller, wherein up to four Ethernet controllers (more than one alternate controller) are used (Kurio, Column 8 Line 14-15). Kurio additionally discloses that, when the primary Ethernet controller fails, the process failover to the alternate Ethernet controller (Kurio, Column 8 Line 14-34); Second

failover means, when said different interface controller fails, transfers processing of said different interface controller to normal interface controller include among said first interface controllers. It is well known in art that takeover mechanism or any other mechanism could be stored in any type of memory, including shared logical volumes.

Referring to claim 9, Kurio teaches the limitation:

"wherein said fail-over is performed in any one of cases where a request to perform said fail-over is received from said information processing apparatus and where a fault occurs in said another channel controller" (Kurio, Column 8 Line 14-34).

Claim 14 is essentially the same as claim 4 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 15 is essentially the same as claim 5 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 16 is essentially the same as claim 6 except that it set forth the claimed invention as a method for controlling a storage device controlling

apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 17 is essentially the same as claim 7 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 18 is essentially the same as claim 8 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

Claim 19 is essentially the same as claim 9 except that it set forth the claimed invention as a method for controlling a storage device controlling apparatus rather than a storage device controlling apparatus including a plurality of first controllers and rejected for the same reasons as applied hereinabove.

As per claim 22, Chen in view Lubbers and further in view of Kurio and further in view of Chhatrapati and further in view of Nelson teaches the limitations:

"further comprising a second channel controller connected to a SAN and having an I/O process which processes to input/output that have been received via the SAN" (Chen, Figure 3: *Gigabit Ethernet Switch/Route*" 270 and *Storage Server 240* combined into *Switch/Server Combination 300* and Paragraph 0038, i.e., *the switch 270 and the storage server 240 are integrated into a switch/server combination 300*) (Note that in the apparatus of Chen in view of Lubbers, Gigabit Ethernet Switch/Router of Chen would be functioning like the second channel controller and network storage controllers (NSCs)of Lubbers would be functioning like the plurality of first channel controllers);

"wherein when the plurality of first channel controllers and the second controller shares a second logical volume" (Chen, Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system.* Note that in the combined apparatus of Chen and Lubbers, a plurality of first channel controllers would share the logical volume(s) of Lubbers and the plurality of first channel controllers and the second controller would share the logical volumes of Chen.), (1) "if one of the first channel controllers receives a plurality of requests to input/output data in a file of the first logical volume" (Lubbers, Paragraph 0019, i.e., *Storage access requests expressed in terms of logical disk addresses;* Paragraph 0035, i.e., *by mapping requests from the connection protocol used by the hosts to the uniquely identified LUN 102;* and Paragraph 0054, i.e., *translation of a request expressed in terms of a logical block address;*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to

input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access) ; and (2) "if some of the plurality of first channel controllers receive a plurality of requests to input/output data in a file of the first logical volume" (Paragraph 0128, i.e., *In response to user requests, the storage system automatically maps storage between memory representations and on-disk media, levels data storage across both logical and physical structures, and quantifies storage capacity as well as location patterns*), "control is performed wherein the first channel controller performs an I/O process for one of the plurality of requests to input/output, during which data area of the file is locked with the use of the file lock table, thereby prohibiting an I/O process for the others of the plurality of requests to input/output from being performed" (Paragraph 0039, i.e., *Device Level Access Control Protocol (DLAP)*" and *These protocols permit shared access to files and folders on a file system*). Note that it is inherent that tables such as a file-lock table or volume-lock table are employed in these protocols (Device-Level Access Control Protocol for block and sector access and File-Level Access Control for file access).

Claim 23 is rejected on the same basis as claim 22.

Claim 24 is rejected on the same basis as claim 22.

Claim 27 is rejected on the same basis as claim 22.

Claim 28 is rejected on the same basis as claim 22.

Claim 29 is rejected on the same basis as claim 22.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Myint whose telephone number is (571) 272-5629. The examiner can normally be reached on 8:30AM-5:30PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-5629.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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